

PROCESSING MAP FOR HOT WORKING CHARACTERISTICS OF A 2205 CAST DUPLEX STAINLESS STEEL

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ABSTRACT

In the present study, the constitutive flow behavior of a 2205 cast duplex stainless steel has been evaluated during warm compression testing in the temperature range 900-1100 °C at strain rates in the range 0.001-0.1 s⁻¹, aided with the micro structural characterization of deformed specimens. Moreover, the constitutive analysis of flow stress was carried out using the hyperbolic sine function, and the material constants were determined. In this context, various deformation mechanisms, including dynamic re crystallization, occurring during warm deformation have been characterized and delineated through construction of a processing map by establishing a power dissipation map and an instability map for the steel and superimposing them. The result shows dynamic re crystallization occurred in the range 900-1030 °C and 0.001-0.003 s⁻¹ with a power dissipation efficiency of 50-60%. In the instability regime, various micro structural defects such as flow localization, kinking and cavities appeared. In this regard, the deformation activation energy of the steel was estimated to be ~263 KJ/Mol.

KEYWORDS: Hot Deformation, Flow Behavior, Processing Map, Constitutive Relationship, Cast 2205 Duplex Stainless Steel